



## IDENTIFICATION OF BRAIN TUMORS IN 2D MRI USING AUTOMATIC SEEDED REGION GROWING METHOD

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**Abstract-** Automated brain tumor segmentation and detection are vastly important in medical diagnostics because it provides information related to anatomical structures as well as potential abnormal tissue necessary to delineate appropriate surgical planning. As the segmentation of anatomical regions of the brain is the fundamental problem in medical image analysis. Segmentation of Brain tumor appropriately is a difficult task in MRI. The MRI image is an image that produces a high contrast images indicating regular and irregular tissues that help to discriminate the overlapping in margin of ach limb. But when the edges of tumor is not sharpen then the segmentation results are not accurate i.e. segmentation may be over or under. This may be happened due to initial stage of the tumors. So , in this paper a modified method of tumor line detection and segmentation is used to separate the irregular from the regular surrounding tissue to get a real identification of involved and noninvolved area that help the surgeon to distinguish the involved area precisely. The method proposed here is seeded region growing method to detect the tumor boundaries in 2D MRI for different cases. This method that can be validated segmentation on 2D MRI Data. In this study, after a manual segmentation procedure, this approach can be converted into fully automated approach.

**Key words-** Brain tumor, Magnetic resonance Imaging (MRI), Image segmentation

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### Introduction

Segmentation is a process of identifying an object or pattern in the given work space. In this project we are considering magnetic resonance image as our work space. Actually the MRI produces a high contrast image representing each part very clearly, but sometimes due to be determined accurately so a problem of segmenting it is always there. In these cases the physiologist always need to have been observation of the anatomical structure. But this

process is too much time consuming and if the initial segmentation result is not correct then other consequent results like volume calculation also produces incorrect measurement results. There are a number of methods for brain tumor segmentation like fuzzy logic approach, neuro fuzzy approach, Random walk etc, but these all methods can produces unsatisfactory results due to

unshaped edge boundaries and also the time to produce desire result is large[6] .

In this paper we are proposing an automatic region growing method to segment the brain tumours. So in this method the users don't need to select the seed point manually therefore there is no need of human intervention [2]. In this project work our assumption is that the brain tumor have grown in considerable size and their structure may be of any type like snakelike or circular shaped etc[1].

### Proposed Method

In this paper our method proposed has divided into five subparts. The output obtained from one part is taken as input to the next part.

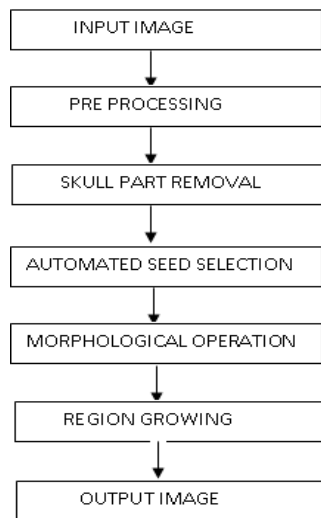


Fig. 1.1- Steps for tumor segmentation

**A. Skull Removal**

This is pre processing step which is required to produce better results. Skull is outer part of the brain surrounding it i.e. the removal of its non-cerebral tissues. The main problem in skull-stripping is the segmentation of the non-cerebral and the intracranial tissues due to their homogeneity intensities. So it may affect the result of seed point selection [8]. Some observations are required to find the range of gray value of skull portion. Following of the steps which are involved in skull removal process:

- First of all find the size of the image and store the no of rows and columns in separate variables.
- Perform iteration for half of the columns and all rows
- Process half of image to convert white pixels into the black pixels by setting their gray value to zero.
- Same steps is repeated for the remaining column and row.

**B. Image Pre processing**

This step involves apply the pre processing filters like mean , median gabour filters to increase the clarity of image, and reduce the unwanted pixels from the image.

**C. Seed Point Selection**

The image obtained after skull removal is taken as input in this part of the project. For the seed point selection our assumption is that tumour's region has grown in considerable size .The following steps are performed to find the seed point:

- Convert the given colored image into the gray image.
- First of all count no pixels whose intensities are greater than hundred and less than hundred and store them in separate variables.
- Find difference between both variables if difference is small then go to step „d“ else convert the image into negative and again set the intensity of external part of the brain to zero and go to step „4“
- Convert the obtained gray image into the binary image.
- Find maximum length and breadth of the brain then from the center convert the pixels in the area of

- rectangle shape of size twenty rows and ten columns to black color.
- Find the sum of all rows individually and store it in the array.
- Find the sum of all the columns and store the results in another array.
- Find the intersection of row and column having maximum sum. This is taken as seed point.

**D. Morphological Image Enhancement**

Morphology mainly deals with the contour and structure of the object. So this is used to perform object extraction, noise removal procedure etc [3]. For the same purpose we are applying these operations to enhance the object boundary and to remove the noise from the image . The most basic

morphological operations are dilation and erosion. Dilation adds pixels to the boundaries of objects in an image, while erosion removes pixels on object boundaries. The number of pixels added or removed from the objects in an image depends on the size and shape of the structuring element used to process the image. In the morphological dilation and erosion operations, the state of any given pixel in the output

image is determined by applying a rule to the corresponding pixel and its neighbours in the input image. The rule used to process the pixels defines the operation as dilation or erosion. One important part in morphological operation is to choose the structuring element. A structuring element is a matrix consisting of only 0's and 1's that can have any arbitrary shape and size. The pixels with values of 1 define the neighbourhood .Two-dimensional, or flat, structuring

elements are typically much smaller than the image being processed. The centre pixel of the structuring element, called the origin, identifies the pixel of interest -- the pixel being processed. The pixels in the structuring element containing 1's define the neighbourhood of the structuring element. In our roject work we are taking DISK shape as structuring element. In the operation of image dilation and erosion we are considering disk structuring element of varying radii so that the obtained image is free from small unwanted parts. In MATLAB working environment there are two built in functions used for dilation and erosion . These morphological functions position the origin of structuring element, its center

element over the pixel of interest in the input image. For pixels at the border of the image, parts of the neighbourhood defined by the structuring element can extend past the border of the image. To process border pixels, the morphological functions assign a value to these undefined pixels, as if the functions had padded the image with additional rows and columns. The value of these padding pixels varies for dilation and erosion operations.

**E. Seeded Region Growing Method**

The result obtained after morphological operation is taken as input in this stage. This approach to segmentation examines neighboring pixels of initial "seed points" and determines whether the pixel neighbors should be added to the region. The process is iterated on, in the same manner as general data

clustering algorithms. The main goal of segmentation is to partition an image into regions. Some segmentation methods such as "Thresholding" achieve this goal by looking for the boundaries

between regions based on discontinuities in gray levels or color properties [7]. Region-based segmentation is a technique for determining the region directly. In our project work 8 connected neighbor region growing method has been used. The basic formulation for Region-Based Segmentation is:

$$(a) \bigcup_{i=1}^n R_i = R.$$

(b)  $R_i$  is a connected region,  $i = 1, 2, \dots, n$

$$(c) R_i \cap R_j = \emptyset \text{ for all } i = 1, 2, \dots, n.$$

(d)  $P(R_i) = \text{TRUE}$  for  $i = 1, 2, \dots, n$ .

$$(e) P(R_i \cup R_j) = \text{FALSE} \text{ for any adjacent region } R_i \text{ and } R_j.$$

$P(R_i)$  is a logical predicate defined over the points in set  $P$

$(R_k)$  and  $\emptyset$  is the null set.

(a) means that the segmentation must be complete; that is, every pixel must be in a region.

(b) requires that points in a region must be connected in some predefined sense.

(c) indicates that the regions must be disjoint.

(d) deals with the properties that must be satisfied by the pixels in a segmented region. For example  $P(R_i) = \text{TRUE}$  if all pixels in  $R_i$  have the same gray level.

(e) indicates that region  $R_i$  and  $R_j$  are different in the sense of predicate  $P$ .

## Conclusions

This project will give following expected outcomes:

- A fast approach for tumor identification and segmentation.
- Improved output segmented image as compare to other approaches.
- An approach which detects the tumor in brain image and needs no human interference.

This method can be useful in many areas:

- In this approach I am suggesting an automated seed selection method, for segmentation of tumor section, so it saves lots of human interference, and may be useful for many other approaches where seed selection is tough task.
- This approach may be useful for neurologist and doctors for identifying brain tumor section, and many other parts of human brain.

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